Model-Driven Command-Line Interface

This section shows the CLI commands that are based on YANG data models and can be used on the router console.

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Model-Driven CLI to Display Data Model Structure

Cisco IOS XR Software provides a rich set of show commands and data models to access data from the router and network. The show commands present unstructured data, whereas data models are structured data that can be encoded in XML or JSON formats. However, both the access points do not always present the same view. Network operators who work on show commands face challenges with adopting the data models when transitioning to programmatic interfaces.

With this feature, these adoption challenges are overcome using **show yang operational** command that is driven by data models. The command uses the data model as the base to display the structured data using traditional CLI command. Using this command, you can simplify parsing scripts via XML and JSON formats.

A data model has a structured hierarchy: model, module, container, and leaf. The following example shows the structure of `ietf-interfaces.yang` data model:

```
ietf-interfaces.yang
module: ietf-interfaces
  +--rw interfaces
  |  +--rw interface* [name]
  |     +--rw name                          string
  |     +--rw description?                  string
  |     +--rw type                          identityref
  |     +--rw enabled?                      boolean
  |     +--rw link-up-down-trap-enable?     enumeration {if-mib}?
  +--ro interfaces-state
        +--ro interface* [name]
        +--ro name                string
        +--ro type                identityref
        +--ro admin-status        enumeration {if-mib}
```

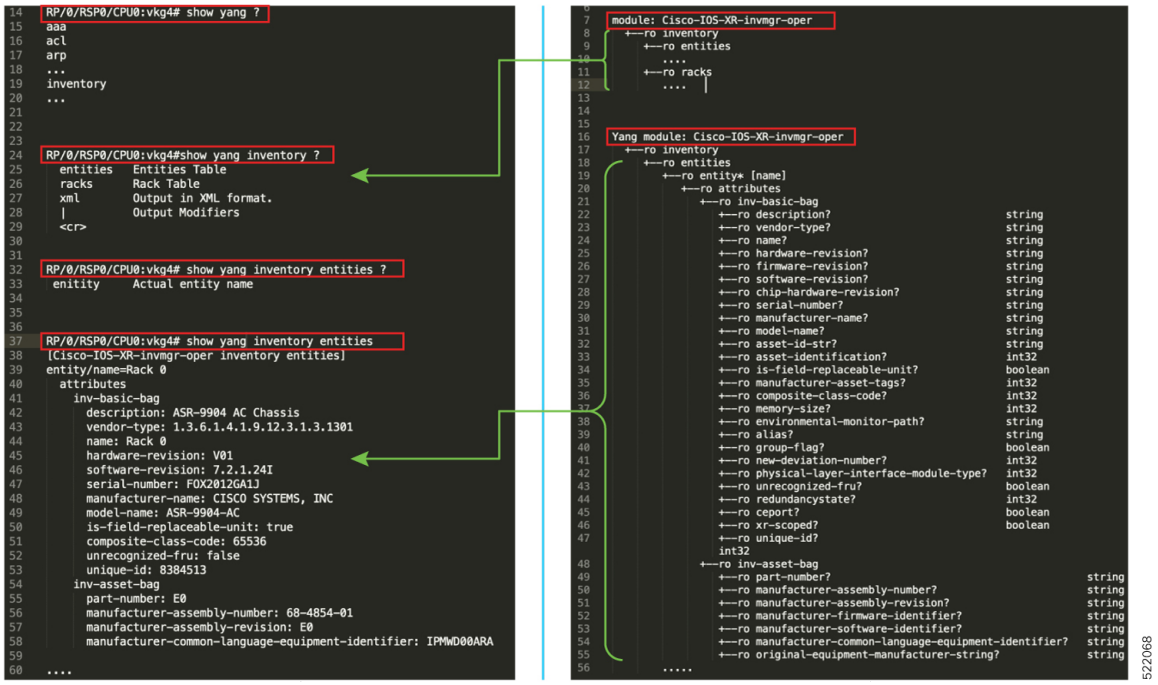
In the example, the hierarchy of the data model is as follows:

- Model—ietf-interfaces.yang
- Module—ietf-interfaces
- Container—interfaces, interface-state

- Node—interface* [name]
- Leaf—name, description, type, enabled, link-up-down-trap-enable, admin-status

You can use the **show yang operational** command to navigate to the leaf level as you do in a data model.

The image show a mapping between CLI and data model, and how the structured data is displayed on the console.



The table shows various queries that can be used to navigate through the hierarchy of a data model using the CLI command. The queries are demonstrated using `Cisco-IOS-XR-interfaces-oper.yang` data model as an example.

Operational Query	Description

Search specific top-level nodes	Search and produce the output of keywords from top-level nodes.
	`Router#`**`show yang operational`**
	`Router#`**`show yang operational | include <component>`**
	The following example shows the search result for interfaces:
	`Router#`**`show yang operational | include interface`**
	`Wed Jul 7 00:02:37.982 PDT`
	`drivers-media-eth-oper:ethernet-interface`
	`ifmgr-oper:interface-dampening`
	`ifmgr-oper:interface-properties`
	`interface-cem-oper:cem`
	`l2vpn-oper:generic-interface-list-v2`
	`pfi-im-cmd-oper:interfaces`

Operational Query	Description

All the instances of the container	Lists all the models at the root level container and its container name.
	`Router#show yang operational ?`
	You can also see the containers for a partially typed keyword. For example, keyword search for `mpls-` displays all the containers with `mpls` :
	`Router#show yang operational mpls-`
	`mpls-io-oper-mpls-ea mpls-io-oper-mpls-ma`
	`mpls-ldp-mldp-oper:mpls-mldp`
	`mpls-lsd-oper:mpls-lsd mpls-lsp-oper:mpls-lsd-nodes`
	`mpls-ldp-mldp-oper:mpls-mldp`
	`mpls-vpn-oper:l3vpn mpls-te-oper:mpls-tp`
	`mpls-te-oper:mpls-te`
	View the container data. The output of the command is in-line with the structure of the data model.
	`Router#show yang operational mpls-static-oper:mpls-static`
	`Request datatree:`
	`filter`
	`mpls-static (ka)`
	`{`
	`"Cisco-IOS-XR-mpls-static-oper:mpls-static": {`
	`"vrfs": {`
	`"vrf": [`
	`{`
	`"vrf-name": "default"`
	`}`
	`]`
	`},`
	`"summary": {`
	`"lsp-count": 0,`
	`"label-count": 0,`
	`"label-error-count": 0,`
	`"label-discrepancy-count": 0,`
	`"vrf-count": 1,`
	`"active-vrf-count": 1,`
	`"interface-count": 0,`
	`"interface-forward-reference-count": 0,`
	`"lsd-connected": true,`
	`"ribv4-connected": false,`
	`"ribv6-connected": false`
	`}`
	`}`
	`}`

Operational Query	Description

All the nodes of the container	`Router#show yang operational mpls-static-oper:mpls-static ?`
	`JSON Output in JSON format`
	`XML Output in XML format`
	`local-labels`
	`summary`
	`vrfs`
	`| Output Modifiers`
	`<cr>`
	Output in JSON Format:
	`Router#show yang operational man-netconf-oper:netconf-yang clients JSON`
	`Mon Sep 27 11:38:27.158 PST`
	`Request datatree:`
	`filter`
	`netconf-yang (ka)`
	`clients`
	`{`
	`"Cisco-IOS-XR-man-netconf-oper:netconf-yang": {`
	`"clients": {`
	`"client": [`
	`{`
	`"session-id": "1396267443",`
	`"version": "1.1",`
	`"connect-time": "52436839",`
	`"last-op-time": "1545",`
	`"last-op-type": "get",`
	`"locked": "No"`
	`}`
	`]`
	`}`
	`}`
	`}`
	Output in XML Format:
	`Router#show yang operational man-netconf-oper:netconf-yang clients XML`
	`Mon Sep 27 11:38:34.218 PST`
	`Request datatree:`
	`filter`
	`netconf-yang (ka)`
	`clients`
	`<netconf-yang`
	`xmlns="http://cisco.com/ns/yang/Cisco-IOS-XR-man-netconf-oper">`
	`<clients>`
	`<client>`
	`<session-id>1396267443</session-id>`
	`<version>1.1</version>`
	`<connect-time>52443884</connect-time>`
	`<last-op-time>1545</last-op-time>`
	`<last-op-type>get</last-op-type>`
	`<locked>No</locked>`
	`</client>`
	`</clients>`
	`</netconf-yang>`

Operational Query	Description

Navigate until the last leaf level	`Router#show yang operational mpls-static-oper:mpls-static summary ?`
	`JSON Output in JSON format`
	`XML Output in XML format`
	`active-vrf-count`
	`im-connected`
	`interface-count`
	`interface-forward-reference-count`
	`mpls-enbled-interface-count`
	`vrf-count`
	`| Output Modifiers`
	`<cr>`
	View data specific to the leaf value. The `read only` (ro) leaves in a YANG model are considered as the state data (operational).
	`Router#show yang operational mpls-static-oper:mpls-static summary active-vrf-count`
	`Request datatree:`
	`filter`
	`mpls-static (ka)`
	`summary`
	`active-vrf-count`
	`{`
	`"Cisco-IOS-XR-mpls-static-oper:mpls-static": {`
	`"summary": {`
	`"active-vrf-count": [`
	`}`
	`}`
	`}`

Model-Driven CLI to Display Running Configuration in XML and JSON Formats

The **show run | [xml | json]** command uses native, OpenConfig and unified models to retrieve and display data.

Use the following variations of the command to generate output:

- **show run | [xml | json]**—Shows configuration in YANG XML or JSON tree.
- **show run | [xml | json] openconfig**—Shows configuration in OpenConfig YANG XML tree.
- **show run | [xml | json] unified**—Shows configuration in unified model YANG XML tree.
- **show run** *component* **| [xml | json]**—Shows configuration in YANG XML or JSON tree for the top-level component. For example, **show run interface | xml**
- **show run** *component* **| [xml | json] unified**—Shows configuration in unified model YANG XML or JSON tree for the top-level component. For example, **show run interface | json unified**
- **show run** *component subcomponent* **| [xml | json]**—Shows configuration in YANG XML or JSON tree for the granular-level component. For example, **show run router bgp 12 neighbor 12.12.12.12 | xml**

- **show run** *component subcomponent* **| [xml | json] unified**—Shows configuration in unified model YANG XML or JSON tree for the granular-level component. For example, **show run router bgp 12 neighbor 12.12.12.12 | json unified**

XML Output

```
Router#show run | xml
Building configuration...
 <data>
  <interface-configurations xmlns="http://cisco.com/ns/yang/Cisco-IOS-XR-ifmgr-cfg">
   <interface-configuration>
    <active>act</active>
    <interface-name>GigabitEthernet0/0/0/0</interface-name>
    <shutdown></shutdown>
   </interface-configuration>
   <interface-configuration>
    <active>act</active>
    <interface-name>GigabitEthernet0/0/0/1</interface-name>
    <shutdown></shutdown>
   </interface-configuration>
   <interface-configuration>
    <active>act</active>
    <interface-name>GigabitEthernet0/0/0/2</interface-name>
    <shutdown></shutdown>
   </interface-configuration>
  </interface-configurations>
  <interfaces xmlns="http://cisco.com/ns/yang/Cisco-IOS-XR-um-interface-cfg">
   <interface>
    <interface-name>GigabitEthernet0/0/0/0</interface-name>
    <shutdown/>
   </interface>
   <interface>
    <interface-name>GigabitEthernet0/0/0/1</interface-name>
    <shutdown/>
   </interface>
   <interface>
    <interface-name>GigabitEthernet0/0/0/2</interface-name>
    <shutdown/>
   </interface>
  </interfaces>
 </data>
```

JSON Output

```
Router#show run | json
Building configuration...
{
  "data": {
    "Cisco-IOS-XR-ifmgr-cfg:interface-configurations": {
       "interface-configuration": [
   {
      "active": "act",
      "interface-name": "GigabitEthernet0/0/0/0",
      "shutdown": [
          null
             ]
           },
           {
      "active": "act",
      "interface-name": "GigabitEthernet0/0/0/1",
      "shutdown": [
          null
      ]
     },
```

```
     {
      "active": "act",
      "interface-name": "GigabitEthernet0/0/0/2",
      "shutdown": [
          null
      ]
     }
   ],
 "Cisco-IOS-XR-man-netconf-cfg:netconf-yang": {
    "agent": {
      "ssh": true
     }
 },
 }
```

Granular-Level Component Output

```
Router#sh run router bgp 12 neighbor 12.12.12.12 | json unified
{
 "data": {
  "Cisco-IOS-XR-um-router-bgp-cfg:router": {
   "bgp": {
    "as": [
     {
      "as-number": 12,
      "neighbors": {
       "neighbor": [
        {
         "neighbor-address": "12.12.12.12",
         "remote-as": 12,
         "address-families": {
          "address-family": [
           {
            "af-name": "ipv4-unicast"
           }
          ]
         }
        }
       ]
      }
     }
    ]
   }
  }
 }
}
```

Unified Model Output

```
Router#sh run router bgp 12 | xml unified
<data>
 <router xmlns=http://cisco.com/ns/yang/Cisco-IOS-XR-um-router-bgp-cfg>
  <bgp>
   <as>
    <as-number>12</as-number>
    <bgp>
     <router-id>1.1.1.1</router-id>
    </bgp>
    <address-families>
     <address-family>
      <af-name>ipv4-unicast</af-name>
     </address-family>
    </address-families>
    <neighbors>
     <neighbor>
```

```
      <neighbor-address>12.12.12.12</neighbor-address>
      <remote-as>12</remote-as>
      <address-families>
       <address-family>
        <af-name>ipv4-unicast</af-name>
       </address-family>
      </address-families>
     </neighbor>
    </neighbors>
   </as>
  </bgp>
 </router>
</data>
```